IMAGE PROCESSING APPARATUS, AND CONTROL METHOD AND PROGRAM FOR IMAGE PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an image processing apparatus which is equipped with plural card slots, a control method for the image processing apparatus, and a program for executing the control method.

Moreover, the present invention relates to a recording apparatus which is equipped with a multislot card reader corresponding to plural kinds of media, a control method for the image processing apparatus, and a program for executing the control method.

Related Background Art

A conventional image processing apparatus which is equipped with a card slot, e.g., a memory card slot, includes only one card slot.

For example, the conventional image processing apparatus has only one PC (personal computer) card slot (also called a PC card reader) which includes only a PCMCIA (Personal Computer Memory Card International Association) interface, as the memory card slot.

However, when a medium (i.e., a memory card

such as an MS (memory stick), an SD/MMC (secure digital/multimedia card), an SM (SmartMedia™), a CF (CompactFlash™) or the like) other than the PC card (i.e., the memory card based on a PCMCIA interface standard) is used for the PC card reader, it is necessary to connect the medium in question to the PC card reader through a conversion adapter. For this reason, the medium which is accessible from the PC card reader is always only one.

As just described, there is a problem that the conventional image processing apparatus which includes only one card slot cannot cope with the plural kinds of memory cards (e.g., the MS, the SD/MMC, the SM, the CF and the like) when there is no conversion adapter.

Incidentally, an image processing apparatus which includes plural card slots becomes available in recent years. In the image processing apparatus of this type, an operator selects a functional card slot by using a slide switch.

However, in this case, when the operator selects the functional card slot by using the slide switch, the operator has to adequately handle the slide switch according to the kind of memory card which the operator wishes to use, whereby there is a problem that the handling of the slide switch is complicated.

Moreover, in another image processing apparatus which becomes available in recent years and includes plural card slots, when a card is inserted into the card slot, the functional card slot is automatically selected and changed if necessary. In this case, even when the card slot has been automatically changed to the functional card slot, the image processing apparatus does not notify an external apparatus (e.g., a personal computer) accessibly connected to the card slot in question that the card slot has been changed. Therefore, when the card slot has been automatically changed to the functional card slot, an operator and the external apparatus accessibly connected to the card slot in question cannot discriminate and confirm such a fact. Thus, when the memory card inserted in the card slot is removed therefrom and then another memory card is inserted in this card slot, the external apparatus accesses the newly inserted memory card on the premise that the memory cart is not changed, whereby there is a fear that the data stored in the inserted memory card is damaged.

That is, in the above image processing apparatus, the card is inserted in and removed from the card slot as the power supply of the apparatus is being on, and the functional card slot is automatically and arbitrarily changed against the

user's intention, whereby there is a problem that the operator may be confused.

Moreover, in the image processing apparatus of this type, there is a fear that a malfunction occurs in a connected external processing apparatus such as a personal computer or the like due to the above automatic change of the card slot.

Furthermore, there is a fear that, when the malfunction occurs in the external processing apparatus such as the personal computer or the like connected to the image processing apparatus, the data stored in the memory card inserted in the card slot of the image processing apparatus is damaged.

In regard to the above problems, in the case where the image processing apparatus is equipped with the multislot card reader, there is a possibility that the card reader accesses the media of which the number corresponds to the number of the provided card slots. However, even in such a case, any problem does not occur if the card reader can simultaneously access the plural media of which the number is the same as that of the card slots.

Incidentally, an MFP (multifunctional printer) is known as an example of the recent image processing apparatus which includes plural card readers. In the MFP, the card reader and the main body of the MFP are connected to each other through a USB (universal

serial bus), and power is supplied to the card reader through a Vbus of the USB. Here, it should be noted that, according to the USB standard, the upper limit of the current capable of being supplied through the Vbus is set to 500mA.

Therefore, in case of simultaneously accessing the media in all the card slots, because the current may become insufficient with respect to some kinds of media, there is a fear that a malfunction occurs in the card reader.

That is, in the conventional recording apparatus which is equipped with the multislot card reader, there is a problem that, when the plural media are respectively inserted in the plural card slots, the malfunction occurs in the card reader due to a lack of the current to be supplied to the inserted medium.

Moreover, for example, in a case where the medium is accessed from a PC which operates based on Windows™ 2000, because only one end point can merely be set for the USB according to the specification of a Windows™ standard file system, the medium in only one of the plural card slots can be accessed according to the standard file system. Thus, there is a problem that it is highly complicated to effectually inform the PC of the accessible and inaccessible media.

That is, in the conventional recording apparatus which is equipped with the multislot card reader, when the plural media are respectively inserted in the plural card slots, the medium in only one of the plural card slots can be accessed according to the standard file system, and it is thus complicated to effectually inform the PC of the accessible and inaccessible media. In other words, there is a problem that an intermediary process between the card reader and the PC is complicated.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an image processing apparatus which is equipped with a card slot and can cope with plural kinds of memory cards (e.g., a CF (CompactFlash™), an SM (SmartMedia™), an MS (memory stick), an SD/MMC (secure digital/multimedia card), and the like), a control method for the image processing apparatus, and a program for executing the control method.

Another object of the present invention is to provide a recording apparatus which is equipped with a multislot card reader, and in which a malfunction in the card reader due to a lack of a current to be supplied to a medium does not occur even when plural media are respectively inserted in plural card slots of the multislot card reader, a control method for

the recording apparatus, and a program for executing the control method.

Still another object of the present invention is to provide a recording apparatus which is equipped with a multislot card reader, and can simplify an intermediary process between the card reader and a PC even in a case where, when plural media are respectively inserted in plural card slots of the multislot card reader, the medium in only one of the plural card slots can be accessed according to a standard file system, a control method for the recording apparatus, and a program for executing the control method.

Other object and features of the present invention will be apparent from the following description in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing the schematic structure of an image processing apparatus 100 according to the first embodiment of the present invention;

Fig. 2 is a schematic diagram showing in detail the exterior appearance of the image processing apparatus 100;

Fig. 3 is a flow chart showing in detail a

processing operation to select an effectual (or available) card slot in a case where a power supply is turned on;

Fig. 4 is a block diagram showing the schematic structure of an image forming apparatus 2100 according to the second embodiment of the present invention;

Fig. 5 is a block diagram showing the details of a card reader unit 2117 in the second embodiment;

Fig. 6 is a flow chart showing an operation of a CPU 2101 in a case where the data of the card reader is printed by the image forming apparatus 2100 (i.e., card direct printing); and

Fig. 7 is a flow chart showing a control operation of a card control unit 2201 in the second embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(First Embodiment)

Fig. 1 is a block diagram showing the schematic structure of an image processing apparatus 100 according to the first embodiment of the present invention.

In the image processing apparatus 100, an MPU (micro-processing unit) 101 functions as a main control unit for an entire system including a CPU (central processing unit), whereby the MPU 101

controls the entire image processing apparatus 100.

A ROM (read-only memory) unit 102 stores therein non-rewritable fixed data such as a control program executed by the MPU 101, a data table referred by the MPU 101, a built-in OS (operating system) program, and the like. In the present embodiment, under the control of the built-in OS stored in the ROM unit 102, the control programs stored in the ROM unit 102 perform software execution control such as scheduling, task switching, interruption and the like, and also achieve a multitasking function including recording control, reading control, communication control and the like.

A backup memory unit 103 consists of an SRAM (static random-access memory) or the like to which a backup power supply is necessary, whereby data can be stored and held in the backup memory unit 103 by using a not-shown data backup primary battery. Thus, program control variables and the like which are improper if deleted are stored in the backup memory unit 103. Besides, the backup memory unit 103 includes a memory area where set values registered by an operator, administration data of the image processing apparatus 100, and the like are stored, and also includes a memory area where card slot effectual (or available) information is stored.

An image storage memory unit 104 consists of a

DRAM (dynamic random-access memory) or the like. Mainly, image data to be handled by the image processing apparatus 100, print data to be transferred to a later-described recording device unit 115, status information obtained from the recording device unit 115, and the like are stored in the image storage memory unit 104. Besides, a partial area of the image storage memory unit 104 is secured as a working area for executing software processes.

A data conversion unit 105 analyzes a PDL (page-description language) or the like, performs CG (computer graphics) decompression or the like of character data, and further performs image data conversion of code data information into bitmap information.

A coding/decoding unit 106 mutually performs a coding process and a decoding process to the image data (i.e., image data of non-compression format, MH (modified Huffman) compression format, MR (modified READ (relative element address)) compression format, MMR (modified modified READ) compression format, JBIG (Joint Bi-level Image experts Group) compression format, JPEG (Joint Photographic Experts Group) compression format, etc.) handled in the image processing apparatus 100, and also performs an enlargement process and a reduction process to the

image data.

An operation unit 107 is equipped with numerical value input keys, character input keys, one-touch telephone number keys, a mode setting key, a determination key, a stop key, a cancel key and the like. The operation unit 107 is used by an operator to determine image transmission destination data, and register the set data of the image processing apparatus 100.

A resolution conversion unit 108 performs resolution conversion control such as mutual conversion between millimeter-system image data and inch-system image data. Also, the enlargement process and the reduction process can be performed to the image data by the resolution conversion unit 108.

A display unit 109 is equipped with an LED (light emitting diode), an LCD (liquid crystal display) and the like. The display unit 109 displays the contents of various input operations by an operator, the operation statuses of the image processing apparatus 100, and the statuses of the recording device unit 115, and the like. Besides, in case of sending out a warning to the operator, the display unit 109 displays warning information by turning on and off the included LED.

A communication unit 110 is equipped with a modem, an NCU (network control unit) and the like.

In the present embodiment, the communication unit 110 is connected to a PSTN (public switched telephone network) 131 (i.e., an analog communication line), controls the communication according to a T30 protocol, and further controls calling and called line control in regard to the communication line.

A recording control unit 111 performs various image processes such as a smoothing process, a recording density correction process, a color correction process and the like to the image data to be printed, through a not-shown image processing control unit, so as to generate high-precise image data. Then, the recording control unit 111 outputs the converted image data to the later-described recording device unit 115 through a later-described USB (universal serial bus) host control unit 114, so as to print the converted image data.

The recording device unit 115 is the recording device such as a laser beam printer, an inkjet printer or the like which is controlled by a not-shown dedicated CPU. That is, the recording device unit 115 records, on a printing material, the color image data or the monochrome image data received from the recording control unit 111. Incidentally, a not-shown EEPROM (electronically erasable and programmable read-only memory) which does not need a backup power supply is connected within the recording

device unit 115, whereby recording control parameters and the like are stored in the EEPROM.

A reading device unit 113 which is connected to a reading control unit 112 optically reads an original by using a CIS (contact image sensor) line sensor or a CCD (charge coupled device) line sensor. Then, the reading control unit 112 converts the read original into electrical image data, performs various image processes such as a binarization process, a halftone process and the like to the converted image data, and outputs the high-precise image data.

Incidentally, in the present embodiment, the reading control unit 112 and the reading device unit 113 can cope with both a sheet reading control system, in which the original is read by the fixed line sensor as it is being transported, and a book reading control system, in which the original fixed on an original glass plate is scanned and read by the moving line sensor.

The USB host control unit 114 which includes a USB analog transceiver and a serial interface engine performs communication control of a USB interface. More specifically, the USB host control unit 114 performs protocol control according to a USB communication standard, converts the data from a USB host control task executed by the MPU 101 into a packet (i.e., packet data), and performs USB packet

transmission to the recording device unit 115 and a later-described memory card device unit 116 both connected to the USB host control unit 114. On one hand, the USB host control unit 114 converts a USB packet from the recording device unit 115 or the memory card device unit 116 into appropriate data, and then transmits the converted data to the MPU 101.

Here, it should be noted that the USB communication standard is the standard by which bi-directional data communication can be performed at high speed, and, by the USB standard, plural devices (i.e., plural slaves) can be connected to one host (i.e., one master).

The USB host control unit 114 has the function as the host in the USB communication, and the recording device unit 115 and the memory card device unit 116 respectively have the functions as the devices in the USB communication. Incidentally, it should be noted that the function as the device in the USB communication is also called a function working.

The memory card device unit 116 which is controlled by a not-shown dedicated CPU includes a not-shown card slot to which recording medium such as a memory card (e.g., a CF (CompactFlash™) card or an SM (SmartMedia™) card) or the like mainly equipped with a flash memory is inserted. That is, the memory

card device unit 116 functions as the card reader/writer on which the data received through the USB interface can be written and from which the data can be read. Incidentally, the card to be inserted in the card slot is not limited to the recording medium, that is, a data input/output card for communication control can be used as the card.

The memory card device unit 116 communicates with the USB host control unit 114 according to a protocol determined based on the USB communication standard. Particularly, the memory card device unit 116 has the function working (i.e., the function as the device).

A USB device control unit 117 which includes a USB analog transceiver and a serial interface engine performs communication control of the USB interface. More specifically, the USB device control unit 117 performs protocol control according to the USB communication standard, converts the data from a USB device control task executed by the MPU 101 into a packet (i.e., packet data), and performs USB packet transmission to a connected external USB host device (e.g., a personal computer 141). On one hand, the USB device control unit 117 converts a USB packet from the host device (e.g., the personal computer 141) into appropriate data, and then transmits the converted data to the MPU 101. That is, the USB

device control unit 117 has the function as the device in the USB communication.

A USB connector (B) 118 is the connector on the side of the device according to the USB communication standard. Besides, the USB connector (B) 118 is the connector of a B-type shape which is connected to the external USB host device such as the personal computer or the like.

Incidentally, the above units 101 to 112, 114 and 117 are mutually connected through a CPU bus 121 under the control of the MPU 101.

Next, the exterior appearance of the entire image processing apparatus 100 will be explained in detail.

Fig. 2 is a schematic diagram showing in detail the exterior appearance of the image processing apparatus 100.

In Fig. 2, a power supply key 21 is used to control a power state of the image processing apparatus 100 as a whole. In case of using the image processing apparatus 100, an operator turns on the power supply of the image processing apparatus 100 by handling the power supply key 21. Besides, in case of ending the use of the image processing apparatus 100, the operator turns off the power supply of the image processing apparatus 100 by handling the power supply key 21.

An operation panel 22 includes the operation unit 107, the display unit 109 and the power supply key 21. Thus, an instruction from the operator is received by the operation unit 107 and the power supply key 21, and the state of the image processing apparatus 100 is notified to the operator through the display unit 109. Besides, in case of performing priority setting of the card slots, the operator has to do so through the operation panel 22.

A card slot A which acts as a first card slot and in which a card is inserted is disposed in the memory card device unit 116.

A card slot B which acts as a second card slot and in which a card is inserted is also disposed in the memory card device unit 116.

That is, it should be noted that the operation unit 107 can be considered as an example of the operation panel which includes the operation unit and the display unit.

Moreover, it should be noted that the MPU unit 101 and the ROM unit 102 act as the means for setting one of the plural card slots as an accessible card slot, and can be considered as an example of the accessible card slot setting means for setting the accessible card slot by using the operation unit and the display unit.

Furthermore, it should be noted that the MPU

unit 101 and the ROM unit 102 can also be considered as an example of the card control means for, in case of accessing the cards inserted in the plural card slots, accessing the card inserted in the accessible card slot set by the accessible card slot setting means.

Next, a processing operation to select the effectual (or available) card slot when the power supply of the image processing apparatus 100 is turned on will be explained in detail.

Fig. 3 is a flow chart showing in detail the processing operation to select the available card slot when the power supply of the image processing apparatus 100 is turned on.

First, it is judged in a step S1 whether or not the power supply of the entire image processing apparatus 100 is turned on by the operator. When it is judged that the power supply is turned on, the flow advances to a step S2. On the contrary, when it is judged in the step S1 that the power supply is not turned on, the process in the step S1 is repeated.

In the step S2, each block constituting the image processing apparatus 100 is initialized by the MPU unit 101. For example, a data check of the backup memory unit 103, initialization of the image storage memory unit 104, initialization of the USB host control unit 114, initialization of the memory

card device unit 116 through the USB host control unit 114, and the like are performed. When the initialization ends in the step S2, the flow advances to a step S3.

Then, it is judged in the step S3 whether or not the card has been inserted in the card slot A of the memory card device unit 116. Here, when it is judged whether or not the card has been inserted, for example, following two judgment methods are supposed.

That is, in the first judgment method, the MPU 101 inquires of the memory card device unit 116 through the USB host control unit 114 as to whether or not the card has been inserted in the card slot A.

In the second judgment method, the MPU 101 inquires of the memory card device unit 116 through a not-shown control line as to whether or not the card has been inserted in the card slot A of the memory card device unit 116.

In any case, when it is judged by the MPU 101 in the step S3 that the card has been inserted in the card slot A, the flow advances to a step S4. On one hand, when it is judged by the MPU 101 in the step S3 that the card is not inserted in the card slot A, the flow advances to a step S9.

In the step S4, it is judged by the MPU 101 whether or not the card slot A has been set to have priority, that is, it is judged whether or not the

card slot A is the accessible card slot. Here, in case of judging whether or not the card slot A has been set to having priority, for example, following three judgment methods are supposed.

That is, in the first judgment method, the order of priority (i.e., the order in setting the card slot as the accessible card slot) is fixedly set beforehand. For example, in a case where it is assumed that the card slot A is dedicated for the CF card and the card slot B is dedicated for the SM card, it is supposed that a customer (i.e., the operator) mainly uses the CF card. In this case, the card slot A may be fixedly set beforehand to have priority as the specification for the image processing apparatus. Here, such an operation is achieved in the portion in the flow chart of Fig. 3 that the judgment in the step S3 as to whether or not the card has been inserted in the card slot A is performed before the judgment in the step S9 as to whether or not the card has been inserted in the card slot B is performed. On the contrary, when it is supposed that the operator mainly uses the SM card, the card slot B may be fixedly set beforehand to have priority as the specification for the image processing apparatus. Here, such an operation is achieved by partially modifying the flow chart of Fig. 3 that the judgment in the step S3 as to whether or not the card has been

inserted in the card slot B is performed, and then the judgment in the step S9 as to whether or not the card has been inserted in the card slot B is performed. Thus, the judgment that the card exists in the card slot B can be performed before the judgment that the card exists in the card slot A is performed. In any case, in the first judgment method, because the processes in the steps S4 and S6 are unnecessary, the process in a step S5 is performed immediately after YES in the step S3. Moreover, if there is no card in the card slots when the power supply is turned on, the judgments in the steps S3 and S9 are repeated through waiting in a step S8. After then, either one of the card slots A and B in which the card is precedently inserted is set as the accessible card slot, and subsequently the setting of the accessible card slot is not changed until the power supply is turned off. That is, after the accessible card slot was once set, even when the card is arbitrarily inserted and removed, the accessible card slot is only the already-set card slot.

In the second judgment method, although either one of the card slots A and B has already been set to have priority, the operator can change the set order or priority for the card slots, that is, the operator can change the order in setting the card slot as the accessible card slot. It should be noted that Fig. 3

shows the second judgment method. For example, the operator previously sets whether the card slot A should have priority or the card slot B should have priority, by appropriately using the operation unit 107 and the display unit 109 on the operation panel 22. Then, the priority card slot information thus set and obtained is written in the backup memory unit 103 by the MPU 101. Thus, the order of priority can be set on the basis of the set and obtained priority card slot information. In Fig. 3, it is set that the card slot A has priority over the card slot B. However, if the operator sets the card slot B to have priority, the flow advances from the step S4 to the step S6 to judge whether or not the card has been inserted in the card slot B even when it is judged in the step S3 that the card has been inserted in the card slot A. Then, when it is judged in the step S6 that the card has been inserted in the card slot B, the flow advances to a step S7. On the contrary, when it is judged in the step S6 that the card is not inserted in the card slot B, the flow advances to the step S5.

In the third judgment method, the order of priority depends on the previous order of priority (i.e., the previous order in setting the card slot as the accessible card slot). For example, in a case where it is assumed that the card slot A has already

been set as the accessible card slot, the MPU 101 stores the already-set order of priority in the backup memory unit 103.

Subsequently, when the power supply of the image processing apparatus 100 is turned on, the MPU 101 first reads the order of priority stored in the backup memory unit 103 and then determines the order of priority according to the read order of priority.

When it is judged by the MPU 101 in the step S4 that the card slot A has been set to have priority, the flow advances to the step S5. On the contrary, when it is judged by the MPU 101 in the step S4 that the card slot A is not set as the accessible card slot, the flow advances to the step S6.

In the step S5, the card slot A is set as the accessible card slot by the MPU 101, whereby the card inserted in the card slot A can be accessed.

That is, for example, when the operator handles the operation unit 107 and the display unit 109 on the operation panel 22 and thus selects the operation to read the data of the memory card inserted in the card slot A or B and print the read data on a recording member, the data of the memory card inserted in the accessible one of the card slots A and B of the memory card device unit 116 is read.

When the card slot A is set as the accessible card slot by the MPU 101 in the step S5, the

operation of automatically changing the card slot ends.

Incidentally, the state that the card slot A has been set as the accessible card slot by the MPU 101 is released when the power supply of the image processing apparatus 100 is turned off. However, it is possible for the MPU 101 to write in the backup memory unit 103 the information representing that the card slot A has been set as the accessible card slot and thus maintain the state that the card slot A has been set as the accessible card slot next time the power supply of the image processing apparatus 100 is turned on.

On one hand, in case of judging in the step S6 whether or not the card has been inserted in the card slot B, for example, following two judgment methods are supposed.

That is, in the first judgment method, the MPU 101 inquires of the memory card device unit 116 through the USB host control unit 114 as to whether or not the card has been inserted in the card slot B.

In the second judgment method, the MPU 101 directly judges through a not-shown control line whether or not the card has been inserted in the card slot B.

In any case, when it is judged by the MPU 101 in the step S6 that the card has been inserted in the

card slot B, the flow advances to the step S7. On the contrary, when it is judged by the MPU 101 in the step S6 that the card is not inserted in the card slot B, the flow advances to the step S5.

In the step S7, the card slot B is set as the accessible card slot by the MPU 101, whereby the card inserted in the card slot B can be accessed.

That is, for example, when the operator handles the operation unit 107 and the display unit 109 on the operation panel 22 and thus selects the operation to read the data of the memory card inserted in the card slot A or B and print the read data on the recording member by the recording device unit 115, the data of the memory card inserted in the accessible one of the card slots A and B of the memory card device unit 116 is read.

When the card slot B is set as the accessible card slot by the MPU 101 in the step S7, the operation of automatically changing the card slot ends.

Incidentally, the state that the card slot B has been set as the accessible card slot by the MPU 101 is released when the power supply of the image processing apparatus 100 is turned off. However, it is possible for the MPU 101 to write in the backup memory unit 103 the information representing that the card slot B has been set as the accessible card slot

and thus maintain the state that the card slot B has been set as the accessible card slot next time the power supply of the image processing apparatus 100 is turned on.

On one hand, in the step S8, the MPU 101 performs the waiting process in regard to the operation of automatically changing the card slot. In the waiting process, a card slot automatic change task to be executed by the MPU 101 on the built-in OS is rested, while another task is executed by the MPU 101. After then, the flow returns to the step S3.

According to the present embodiment, the image processing apparatus which is equipped with the card slot can cope with the all kinds of memory cards (e.g., the CF card, the SM card, the MS, the SD/MMC, and the like).

Incidentally, in case of judging in the step S9 whether or not the card has been inserted in the card slot B, for example, following two judgment methods are supposed.

That is, in the first judgment method, the MPU 101 inquires of the memory card device unit 116 through the USB host control unit 114 as to whether or not the card has been inserted in the card slot B.

In the second judgment method, the MPU 101 directly judges through the not-shown control line whether or not the card has been inserted in the card

slot B.

In any case, when it is judged by the MPU 101 in the step S9 that the card has been inserted in the card slot B, the flow advances to the step S7. On the contrary, when it is judged by the MPU 101 in the step S9 that the card is not inserted in the card slot B, the flow advances to the step S8.

According to the present embodiment, in the image processing apparatus which is equipped with the plural card slots, it is unnecessary to provide a slide switch for selecting the accessible card slot, and it is thus unnecessary for the operator to handle any slide switch.

Moreover, according to the present embodiment, in the image processing apparatus which is equipped with the plural card slots, the accessible card slot does not arbitrarily change even when the card is inserted in and removed from the card slot. Thus, the card slot that the operator does not intend is not changed as the accessible card slot, whereby there is no confusion for the operator.

Furthermore, according to the present embodiment, in the image processing apparatus which is equipped with the plural card slots, because the card slot that the operator does not intend is not changed as the accessible card slot, there is no possibility that a malfunction occurs in the

connected external processing apparatus such as a personal computer or the like.

In addition, according to the present embodiment, in the image processing apparatus which is equipped with the plural card slots, because the card slot that the operator does not intend is not changed as the accessible card slot, there is no possibility that the data of the memory card inserted in the card slot is damaged due to the malfunction occurred in the connected external processing apparatus such as the personal computer or the like.

Incidentally, the flow chart shown in Fig. 3 is directed to the operation of the image processing apparatus which is equipped with, e.g., the two card slots of the card slot A and the card slot B. However, it is needless to say that the present embodiment is also applicable to an image processing apparatus which is equipped with three or more card slots.

Moreover, the present embodiment can be grasped as the invention of computer programs.

That is, in the program to be executed by the image processing apparatus equipped with the plural card slots in which the detachable cards are respectively inserted, the present embodiment is directed to the procedure for setting one of the plural card slots as the accessible card slot.

Moreover, the present embodiment is directed to the accessible card slot setting procedure of setting one of the plural card slots as the accessible card slot by using the operation unit and the display unit provided on the operation panel, and storing the set accessible card slot in the predetermined memory, and also to the card control procedure of, in case of accessing the cards inserted in the plural card slots, accessing the card inserted in the accessible card slot set in the accessible card slot setting procedure.

In this case, the above program may be the program to change the accessible card slot set in the accessible card slot setting procedure to be unavailable when the power supply of the entire image processing apparatus is turned off.

Moreover, the above program may be the program which includes the main control procedure to control the entire image processing apparatus, and the card detection procedure to judge based on the command inquiry in the above card control procedure whether or not the cards have been respectively inserted in the plural card slots and then store the judged result in the predetermined memory.

Furthermore, the above main control procedure may be the procedure to judge based on the signal generated in the card reading procedure whether or

not the cards have been respectively inserted in the plural card slots and then store the judged result in the predetermined memory.

Besides, the above accessible card slot setting procedure may be the procedure to set, when the power supply of the entire image processing apparatus is turned on in the state that the cards are not inserted in all of the plural card slots, the card slot in which the card is first inserted, as the accessible card slot, and then store the set accessible card slot in the predetermined memory.

Moreover, the above program may be the program which includes the card slot determination procedure to, when the power supply for the entire image processing apparatus is turned on in the state that the plural cards have been inserted in the plural card slots, determine the accessible card slot according to the predetermined order of priority, and then store the determined accessible card slot in the predetermined memory.

Furthermore, the above program may be the program which includes the card slot determination procedure to, when the power supply for the entire image processing apparatus is turned on in the state that the plural cards have been inserted in the plural card slots, determine the accessible card slot according to the order of priority previously set by

the operator, and then store the determined accessible card slot in the predetermined memory.

Besides, the above accessible card slot setting procedure may be the procedure to set, when the power supply for the entire image processing apparatus is turned on in the state that the plural cards have been inserted in the plural card slots, the card slot which was set as the accessible card slot last time, as the accessible card slot, and then store the set accessible card slot in the predetermined memory.

According to the first embodiment of the present invention, there is the effect that the image processing apparatus equipped with the card slot can cope with the all kinds of memory cards (e.g., the CF card, the SM card, the MS, the SD/MMC, and the like).

(Second Embodiment)

Fig. 4 is a block diagram showing the schematic structure of an image forming apparatus 2100 according to the second embodiment of the present invention.

In the image forming apparatus 2100, a CPU 2101 functions as a system control unit for controlling the entire apparatus.

A ROM 2102 stores therein a control program executed by the CPU 2101, a built-in OS program, and the like. In the present embodiment, under the control of the built-in OS stored in the ROM 2102,

the control programs stored in the ROM 2102 perform software execution control such as scheduling, task switching and the like.

A RAM 2103 which consists of an SRAM or the like stores program control variables, set values registered by an operator, administration data for the image forming apparatus 2100, and the like. Moreover, the RAM 2103 includes a buffer area to be used for various workings.

An image memory 2104 which consists of a DRAM or the like accumulates image data.

A data conversion unit 2105 analyzes a PDL or the like, performs CG decompression or the like of character data, and further performs image data conversion.

An original is optically read by a CIS (contact image sensor) of a reading unit 2107, and then transferred to a reading control unit 2106. In the reading control unit 2106, the image signal obtained by converting the read electrical image data is subjected to various image processes such as a binarization process, a halftone process and the like through a not-shown image processing control unit, whereby high-precise image data is finally output. Incidentally, in the present embodiment, the reading control unit 2106 and the reading unit 2107 can cope with both the sheet reading control system, in which

the original is read by the fixed line sensor as it is being transported, and the book reading control system, in which the original fixed on the original glass plate is scanned and read by the moving line sensor.

An operation display unit 2108 is equipped with an operation unit, various keys, an LED, an LCD, and the like. More specifically, the operation unit is further equipped with numerical value input keys, character input keys, one-touch telephone number keys, a mode setting key, a determination key, a stop key, a cancel key and the like, and is used by the operator to determine image transmission destination data, and register the set data. Besides, the operation display unit 2108 displays the contents of various input operations by the operator, the operation statuses of the image forming apparatus 2100, and the like.

A communication control unit 2109 is equipped with a modem, an NCU and the like. In the present embodiment, the communication control unit 2109 is connected to a PSTN 2131 (i.e., an analog communication line), controls the communication according to a T30 protocol, and further controls calling and called line control in regard to the communication line.

A resolution conversion processing unit 2110

performs resolution conversion control such as mutual conversion between millimeter-system image data and inch-system image data. Also, the enlargement process and the reduction process can be performed to the image data by the resolution conversion processing unit 2110.

A coding/decoding processing unit 2111 mutually performs a coding process and a decoding process to the image data (i.e., image data of MH compression format, MR compression format, MMR compression format, JBIG compression format, JPEG compression format, etc.) handled in the image forming apparatus 2100, and also performs an enlargement process and a reduction process to the image data.

A recording control unit 2112 performs various image processes such as a smoothing process, a recording density correction process, a color correction process and the like to the image data to be printed, through a not-shown image processing control unit, so as to generate high-precise image data. Then, the recording control unit 2112 outputs the converted image data to a USB host control unit 1 2114. Moreover, the recording control unit 2112 periodically obtains status information of the recording unit 2115 through the USB interface by controlling the USB host control unit 1 2114.

A USB function control unit 2113 which performs

communication control of the USB interface performs protocol control according to a USB communication standard, converts the data from a USB control task executed by the CPU 2101 into a packet (i.e., packet data), and performs USB packet transmission to an external information processing terminal 2200 such as a PC or the like. On one hand, the USB function control unit 2113 converts a USB packet from the external information processing terminal 2200 into appropriate data, and then transmits the converted data to the CPU 2101.

Each of the USB host control unit 1 2114 and a USB host control unit 2 2116 is the control unit which should perform the communication based on the protocol determined according to the USB communication standard. Here, it should be noted that the USB communication standard is the standard by which bi-directional data communication can be performed at high speed, and, by the USB standard, plural hubs or plural function devices (i.e., plural slaves) can be connected to one host (i.e., one master), and the USB host control unit has the function as the host in the USB communication.

The USB host control unit 1 2114 is connected to the recording unit 2115 to transfer and control the commands and the data for data recording.

The recording unit 2115 which is the printing

apparatus such as a laser beam printer, an inkjet printer or the like prints the color image data or the monochrome image data on a printing material. The USB host control unit 1 2114 performs the communication according to the protocol determined based on the USB communication standard. Particularly, the recording unit 2115 has the function working.

The USB host control unit 2 2116 which is connected to a card reader unit 2117 through the USB interface transfers and receives various commands and data to and from the card reader unit 2117. The USB host control unit 2 2116 transfers the command and the data from the USB function control unit 2113 to the card reader unit 2117 so that the card reader unit 2117 acts as the removable disk of the external information processing apparatus 2200 to read the image data from various memory cards inserted in the card reader unit 2117 and then print the read image data by using the recording unit 2115. Incidentally, power is supplied from the USB host control unit 2 2116 to the card reader unit 2117 through the Vbus of the USB interface. Here, it should be noted that, according to the USB standard, the upper limit of the current capable of being supplied through the Vbus is set to 500mA, whereby it is controlled to stop the power supply when the current exceeding 500mA flows.

The card reader unit 2117 is the multislot card reader which can cope with the plural kinds of memory cards, and is connected to the USB host control unit 2 2116 through the USB interface. Incidentally, it is detected whether or not the memory cards have been inserted in the plural card slots of the card reader unit 2117, and a medium detection signal 2118 representing the detected result is transferred from the card reader unit 2117 to the port of the CPU 2101, whereby the CPU 2101 can recognize what kinds of memory cards have been inserted in the card reader. The card reader unit 2117 will be explained in detail with reference to Fig. 5.

In the present embodiment, the USB communication of the recording function is achieved by using one-to-one connection conformation.

By the way, the above structural components 2101 to 2106, 2108 to 2114 and 2116 are mutually connected through the CPU bus 2121 under the control of the CPU 2101.

Fig. 5 is a block diagram showing the details of the card reader unit 2117 in the present embodiment.

The card reader unit 2117 is connected to the main system by a USB function control unit 2202 through the USB interface, and the power is supplied to the card reader unit 2117 through the Vbus of the

USB interface. Incidentally, the card reader 2117 includes the four kinds of card slots (connectors), i.e., a CF card connector 2204, an SD (secure digital) card connector 2206, an SM card connector 2208, and an MS (memory stick) connector 2210.

First, the medium detection signals 2118 representing that the cards have been respectively inserted in the card slots (connectors) are generated. Thus, a CF detection signal (CF_Det/n), an SD detection signal (SD_Det/n), an SM detection signal (SM_Det/n) and an MS detection signal (MS_Det/n) are respectively input to a card control unit 2201 which controls the entire card reader unit 2117. Here, the detection signals 2118 are also input to the port of the CPU 2101. The power of 5V supplied through the Vbus is converted into the power of 3.3V by a regulator 2203 and used as the power of the card reader unit 2117.

Then, the power is supplied to the card (medium) inserted in each connector through the corresponding connector. In this case, the power is appropriately turned on/off by FET's 2205, 2207, 2209 and 2211 in response to the medium detection signal 2118, whereby it is controlled to supply the power to only one kind of card at a time.

That is, as just described, to control the power supply to only one kind of card at a time is

easy to understand when card exclusive control is performed, and is also to control the current consumption at the card reader unit so that it does not exceed the maximum supply current 500mA through the Vbus.

For example, when the CF card is inserted in the CF card connector 2204, the CF detection signal (CF_Det/n) is set to L. Then, in response to this signal, PWON signals other than a signal (V_CF_PWON/n) are set to H by the card control unit 2201, whereby the power is supplied to only the CF card connector 2204, and it is impossible in this state to detect the medium in other connectors. After then, when it is detected that the CF card is removed from the CF card connector 2204, all the PWON signals are set to L, whereby it is possible to detect the cards in all the connectors.

Fig. 7 is a flow chart showing the control operation of the card control unit 2201 in the present embodiment.

First, in a step S2401, it is judged by monitoring the CF detection signal (CF_Det/n) whether or not the CF card has been inserted. When it is judged that the CF card is not inserted, the flow advances to a step S2402 to judge by monitoring the SD detection signal (SD_Det/n) whether or not the SD card has been inserted. When it is judged that the

SD card is not inserted, the flow advances to a step S2403 to judge by monitoring the SM detection signal (SM_Det/n) whether or not the SM card has been inserted. Then, when it is judged that the SM card is not inserted, the flow advances to a step S2404 to judge by monitoring the MS detection signal (MS_Det/n) whether or not the MS has been inserted. Finally, when it is judged that the MS is not inserted, the flow advances to a step S2405 to turn off all the currents (i.e., V_CF_PWON/n, V_SD_PWON/n, V_SM_PWON/n, and V_MS_PWON/n = L). Then, the flow returns to the step S2401.

On one hand, when it is judged in the step S2401 that the CF card has been inserted, the flow advances to a step S2406 to turn off the power supply for the connectors other than the CF connector (i.e., V_CF_PWON/n = L; V_SD_PWON/n, V_SM_PWON/n, and V_MS_PWON/n = H), and further advances to a step S2407 to transfer the data of the CF card from the USB function control unit 2202. Then, the flow returns to the step S2401. In fact, the information representing whether or not the medium exists in the connector, the file information in the medium, and the like are transferred and written in response to the command issued from the USB host control unit 2 2116. However, these operations are simply called the data transfer as a matter of convenience.

Likewise, when it is judged in the step S2402 that the SD card has been inserted, the flow advances to a step S2408 to turn off the power supply for the connectors other than the SD connector (i.e., V_SD_PWON/n = L; V_CF_PWON/n, V_SM_PWON/n, and V_MS_PWON/n = H), and further advances to a step S2409 to transfer the data of the SD card from the USB function control unit 2202. Then, the flow returns to the step S2401.

Likewise, when it is judged in the step S2403 that the SM card has been inserted, the flow advances to a step S2410 to turn off the power supply for the connectors other than the SM connector (i.e., V_SM_PWON/n = L; V_CF_PWON/n, V_SD_PWON/n, and V_MS_PWON/n = H), and further advances to a step S2411 to transfer the data of the SM card from the USB function control unit 2202. Then, the flow returns to the step S2401.

Likewise, when it is judged in the step S2404 that the MS has been inserted, the flow advances to a step S2412 to turn off the power supply for the connectors other than the MS connector (i.e., V_MS_PWON/n = L; V_CF_PWON/n, V_SD_PWON/n, and V_SM_PWON/n = H), and further advances to a step S2413 to transfer the data of the MS from the USB function control unit 2202. Then, the flow returns to the step S2401.

As just described, in the card reader unit 2117, the data of the two kinds of cards are not transferred to the USB host control unit 2 2116 simultaneously (that is, the data of the two kinds of cards are not transferred as changing the end points and by using packet multiplex). Thus, the USB host control unit 2 2116 or the CPU 2101 may transfer the transferred data to the recording unit 2115 and the USB function control unit 2113 as it is.

Next, the operation which is performed by the CPU 2101 when the data of the card reader unit is printed (that is, card direct printing is performed) by the image forming apparatus 2100 will be explained.

Fig. 6 is a flow chart showing the operation of the CPU 2101 when the data of the card reader unit is printed by the image forming apparatus 2100 (i.e., the card direct printing is performed).

When a card direct print mode is set through the operation of the operation display unit 2108, it is judged in a step S2301 whether or not the medium has been inserted in the card reader unit 2117, based on the medium detection signal 2118 or the response received by the USB host control unit 2 2116. When it is judged that the medium has been inserted, the flow advances to a step S2302 to judge whether or not an image file exists in the file included in the inserted medium, based on the response received by

the USB host control unit 2 2116. Then, when it is judged that the image file exists, the flow advances to a step S2303 to read the image data. Then, in a step S2304, the received image data is transferred from the USB host control unit 1 2114 to the recording unit 2115, whereby the transferred image data is actually printed. That is, an ordinary printing process is performed. After then, the process ends.

On one hand, when it is judged in the step S2301 that the medium is not inserted, the flow advances to a step S2305 to cause the operation display unit 2108 to display a message "INSERT CARD".

Besides, when it is judged in the step S2302 that the image file does not exist, the flow advances to a step S2306 to cause the operation display unit 2108 to display a message "NO IMAGE".

After then, the flow returns to the step S2301. Incidentally, when the mode is changed to another mode by handling the operation display unit 2108, the process in the changed mode is performed from that time.

The present embodiment can be grasped as the invention of computer programs.

That is, the present embodiment can be grasped as an example of the program for causing the recording apparatus which includes the card reader

having the external interface and the plural connection units in which the plural kinds of external storage cards are inserted and which respectively correspond to the plural kinds of external storage cards, the connection means for connecting with the external interface, the data reading means for reading the data of the external storage card from the card reader through the connection means, and the recording means for recording the data read by the reading means, to execute the control procedure of causing the card access exclusive control unit to perform the control so as to transfer the data of the external storage card inserted in selected one of the plural kinds of connection units to the external interface or transfer the data from the external interface to the external storage card inserted in the selected one connection unit.

In this case, the above program is the program for causing the recording apparatus to execute the control procedure of performing the control to be able to access the external storage card through the connection means connecting with the external information processing apparatus.

Moreover, the present embodiment can be grasped as an example of the program for causing the recording apparatus which comprises the card reader

including the plural connection units in which the plural kinds of external storage cards are inserted and which respectively correspond to the plural kinds of external storage cards, the connection means for connecting with the card reader, the data reading means for reading the data of the external storage card from the card reader through the connection means, and the recording means for recording the data read by the reading means, to execute the detection procedure of detecting respectively that the plural kinds of external storage cards have been inserted in the respective connection units, and outputting the detection signals indicating the respective detected results, and the power supply changeover procedure of causing the power supply changeover circuit to supply the power for the external storage card to only one of the plural connection units on the basis of the respective detection signals.

According to the present invention, the so-called exclusive control is performed so that, at a time when the medium is first inserted in the card slot of the card reader, it becomes impossible to access the media inserted in the card slots other than the card slot in which the medium is first inserted, whereby it is possible to prevent that the currents in the two or more kinds of media are consumed simultaneously. Thus, it is possible to

obtain the effect that the malfunction in the card reader due to a lack of the current to be supplied to the medium does not occur even when the plural media are respectively inserted in the plural card slots of the card reader.

Moreover, according to the present invention, the exclusive control is performed to the media so that the medium inserted in only one of the plural card slots can always be accessed from the PC. Thus, it is possible to obtain the effect that the intermediary process between the card reader and the PC can be simplified.

Finally, as many apparently widely different embodiments of the present invention can be made without departing from the spirit and scope thereof, it is to be understood that the present invention is not limited to the specific embodiments thereof except as defined in the appended claims.